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PAKISTAN STANDARD

Gas Cooking Ranges

PAKISTAN STANDARDS AND QUALITY CONTROL AUTHORITY
Standards Development Centre,
39 – Garden Road, Saddar,
Karachi – 74400.

PAKISTAN STANDARDS SPECIFICATION
FOR
Gas Cooking Ranges

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C O N T E N T S

Pakistan Standard Specification

For

GAS COOKING RANGES

0. Foreword:

0.1 This Pakistan Standard was adopted by the authority of the Board of Directors for Pakistan Standards & Quality Control Authority after the draft prepared by the Technical Committee (TC-18) for "Oil and Gas Burning Appliances" is approved and endorsed by the Mechanical Engineering National Standards Committee on 12-02-2008.

0.2 In preparing this standards assistance has been derived from:

i) Sui Southern Gas Company Limited (SSGCL) / Sui Northern Gas Pipelines Limited (SNGPL).

ii) BS-IS: 4760/1992 Domestic Cooking Ranges.

iii) BS-IS: 5116/1977 General Requirements.

which are acknowledged with thanks.

0.3 This Pakistan Standard has been prepared after taking into consideration, the views and suggestions of manufacturers, specialists and utilizing agencies.

0.4 This standard is subject to periodical review in order to keep pace with development in technology. Any suggestion for improvement will be recorded and placed before the concerned committee in due course.

1. SCOPE:

1.1. This standards covers construction, operation, safety requirements and tests for domestic cooking ranges having oven with thermostat for use with natural gas having a gross calorific value between 850-1150 Btu/Cu ft supplied at a pressure not exceeding 14" water column.

2. CONSTRUCTION REQUIREMENTS:

2.1 TEST FOR STRENGTH OF GAS RANGE FRAMES:

Base frames, form frames and top frames when subjected to a load of 150 pounds (68kg) applied for a period of 5 minutes at the top of range as close as possible to the centre shall not show:-

a) Breakage or permanent damage to any part thereof: nor
b) A maximum permanent deformation in excess of 0.02 inch

2.2. METHOD OF TEST:

Application of the load shall be made over a width of approximately 4 inches and a depth of approximately that of cooking top for cabinet range. The load shall be placed on the inside of cooking top as close to the oven as possible. For other type of ranges, the load shall be placed as close as possible to the centre of the range, removable top plates or top plates shall be removed during this test.

Any permanent damage breakage or permanent deformation shall be noted.

Drop door when over 6 inches in height shall have a spring counter-balance or friction control. Exception is made when structural steel forms are used exclusively for the range front and door frames or no breakable cast iron parts are used in the hinging.

Drop door when fully open shall lie and remain in position.

Drop door when fully open and subjected to a connected load of 25 pounds applied over a 5 square inch area for a period of 5 minutes without impact to one outer corner of the fully opened door and with the other outer corner rigidly supported shall not show:-

a) Breakage or permanent damage to any part thereof: nor
b) Deflection during application o the load from its normal position measured at the free corner in excess of 0.5 inch.

Oven and griller doors when subjected to a load of 50 lbs. (22.7kg) uniformly applied for a period of 5 minutes without impact along the top edge of swing door or along a strip 4 inches wide and the full width of drop door equidistant from the hinges and outer edge of the door when fully open shall not show:-

a) Breakage or permanent damage to any part thereof: or
b) Deflection during application of the load from its normal position in excess of 0.5 inch at a point 6 inches from the hinge.

In the event that door is hinged to a griller drawer, the entire assembly shall be inserted into the range as far as the open door permits or until the inner edge of the door, in the fully open position, coincides with the part of the range where door is attached.

Legs and bases if not detachable shall be considered part of the range body.

Bottoms of base and legs shall have no sharp edges in contact with floor.

Range bases and legs shall be substantially rigid to the extent that they will not be permanently deformed or damaged by moving an assembled range on its base, 3 feet (0.9m) along a smooth concrete floor endwise or sidewise, by pressure exerted in normal manner against the top end or top side respectively, sufficient to cause the range to move freely.

Total area of contact between the range base or legs and the floor shall be large enough to provide at least 1 square inch of contact to each 50 pound (22.7 kg) of range weight.

2.3 GAS SUPPLY LINES:

Pipe and fitting used in domestic range shall be of copper capable of withstanding a temperature of 1000°F (540°C) without melting.

2.4 BURNER UNITS:

Main bodies of burners (including mixer head, mixer tube and burner head) shall be substantial and durable construction metal having a melting point below 950°F (510°C) shall not be considered acceptable for top burner while metals having a melting point below 1450°F (788°C) shall not be considered acceptable for oven or grill burner or any combination thereof.

2.5 COOKING TOPS, TOP COVERS AND GRATES:

Top grates shall be designed so that either they cannot be firmly placed in other than the proper position or if improper or inverted placement is possible combustion shall be unimpaired when operating in that manner.
Design of open top grate arms shall be such that they will support utensils as small as 2¼ inches in diameter when placed centrally over the burner.
Individual grates shall be firmly supported and positioned to prevent rocking in their supports or any shifting or lateral movement in excess of 1/8 inch

2.6 OVEN RACKS, RACK SUPPORTS AND GRILLER PANS:

The main baking oven of a gas range shall be equipped with two or more oven racks of sufficient strength to sustain, without becoming dislodged, the following loads when distributed upon 2/3 the area of the rack:-

WIDTH OF RACK (Inches)	**LOAD** (lbs.)
Up to 14	10
14 to 18	15
18 to 22	20

At least one rack position for each full 3 ½ inches of oven height shall be provided.

Oven and Griller pans shall be supported in a horizontal plane and shall not bind against the rack supports or linings when oven(s) and griller(s) are either hot or cold.

When removable oven rack supports are used, they shall be rigidly held in place and shall be supported and constructed so as to prevent racks from binding.

Rack supports shall be constructed so that they will prevent racks from tilting when partially withdrawn.

2.7 MATERIAL

The frame of the body shall be manufacture from at least 0.6mm M.S.sheet having minimum 28kg/mm^2 (4000 psi) tensile strength and the hardness 85 HV or stainless steel of the same gauge.

2.7.1 The materials used in the construction of the appliance or parts of the appliance shall be resistant to wear and deterioration occurring in the normal use. The burner parts shall not melt or distort when the stove burner is operated with flames flashed back for half and in the mixing tube.

2.7.2 The main body of the burner (including mixer head, mixing tube and burner head) shall be of substantial and durable construction. Metals having a melting point below 950°F (510^{o}C) shall not be considered acceptable for top burners while metals having a melting point below 1472°F (800^{o}C) shall not be considered for oven.

2.8 THERMAL INSULATION MATERIAL:

Thermal insulation material shall be such that it is re-usable, suitably enclosed and protected from objectionable exposure to air and maintain uniformity of insulation.

2.9 THERMOSTAT:

The main baking oven shall be equipped with a thermostat.
Throttling type oven thermostats shall be by-passed to permit a minimum safe gas flow with thermostatic valve closed.

Thermostat should preferably be so designed that the valve can be withdrawn from the body and, after cleaning, replaced without alteration to the temperature calibration. If so, this operation shall be possible without the necessity of first removing the complete thermostat from the appliance.

By-pass orifice shall be readily accessible for cleaning and should preferably be non-adjustable.

Settings shall be indicated by easily distinguishable durable markings.

A sealing or locking device shall be provided to prevent interference with calibration.

2.10 FLUE DEFLECTORS:

Flue deflector outlet openings shall be located and designed so that the direction of flue gas discharge will not be vertical.

Total free area of the deflector vent shall be adequate to pass all the flue products discharged through the oven vent openings.

Minimum opening of any outlet or of any flue passage way in a flue deflector shall be at least ¼ inch on the smallest dimension and have an area not less than ¼ square inch.

The design of the outlet openings of a flue deflector or their position with respect to range top surfaces shall be such as to prevent closure or restriction of such openings by utensils placed on the range top surfaces.

Flue deflectors shall be constructed so that they cannot be installed in other than the correct position.

2.11 Oven glass shall be properly tempered to sustain temperature of 598^{o}F (300°C) without breaking.

2.12 Burner knobs shall be of such material so as to withstand high temperature effect due to oven and grill operation at their maximum temperatures.

2.13 Oven and Grills be preferably equipped with safety devices for flame failure.

3. PERFORMANCE REQUIREMENTS:

3.1 BURNER CAPACITIES:

Gas input ratings of domestic range burners at normal test pressure shall be as follows:-

a.	Small Top Burner	not less than 8,000 Btu per hour
b.	Medium Top Burner	not less than 12,000 Btu per hour.
c.	Oven Burner	Specified by the manufacturer.
d.	Grill Burner	Specified by the manufacturer

3.2 COMBUSTION:

Any burner of the gas range shall produce no carbon monoxide. This requirement shall be deemed met when a concentration not in excess of 0.01 percent is produced in a room of 1000 ft.^{3} /28.3m^3 content with 4 air changes occurring during the combustion of an amount of gas liberating 60000 Btu.

3.2.1 METHOD OF TEST:

Burners shall be adjusted as specified above. Thermostat shall be set at their maximum open position. Analysis for carbon monoxide shall be on an air free basis. Carbon monoxide concentration in a 1000 ft.^{3} /28.3m^3 room will be calculated by the following formula:-

$C_r = 0.0147 \times C_a \times V$

Where

C_r = Concentration of CO in room atmosphere, %

C_a = CO in air free products of combustion, %

V = Volume of combustion products per 1000 Btu (exclusive of water vapor), Cu.ft.

A utensil 7½ inches diameter (bottom) containing 5 Ibs.(2.3 kg)of water at approximate room temperature shall be placed over each top burner. A suitably designed hood shall then be placed on the cooking top. Oven and broiler burners shall be put in operation simultaneously with top burners and operated during the time the samples of flue gases from the top burners are taken. After the burners have been in operation for 5 minutes, samples of the flue gases at the reduced and increased test pressure shall be drawn from the hood vent and analyzed for carbon monoxide and carbon dioxide.

When the construction of the range is such that incomplete combustion might be expected to result at normal test pressure, sample of the flue gases shall be secured at this test pressure and analyzed.

3.3 BURNER OPERATING CHARACTERISTICS:

3.3.1 Test for flame extinguishment due to opening and closing of doors or drawers:

When operated at normal test pressure burner flame shall not be extinguished by "snapping" open or quickly closing any door.

3.3.2 Test for lifting, floating and blowing of top burner flames:

Top burner flames shall not show objectionable lifting, floating, blowing, or otherwise be adversely affected by operation of oven and griller burners.

3.3.3 Test for flame extinguishment due to operation of other sections:

Burner flames of any section shall not be extinguished nor exhibit signs of smothering as the result of simultaneous operation of the sections.

A small or medium top burner, or a section thereof, to be classified as capable of simmering operation, shall be capable of maintaining a stable flame on the ports to which gas is flowing at an input rating of 500 Btu per hour or less.

3.3.4 Tests for ignition at top burners:

Ignition of gas at the burner shall occur within 4 seconds after gas is available at the burner ports.

3.3.5 Test for ignition at oven, boiler and other compartment burners:

Ignition of the gas at the oven or grill burner shall occur within 4 seconds after gas is available at the burner ports.

3.4 TOP BURNER THERMAL EFFICIENCY:

Thermal efficiency of small and medium top burners shall be not less than 48 percent for burners having rated inputs from 8000 Btu/hr. to 10,000 Btu/hr and not less than 45 percent for burners having rated inputs exceeding 10,000 Btu/hr.

3.4.1 METHOD OF TEST

Test shall be conducted at normal test pressure with a hot start. A weighed amount of water, 4 pound for small burners and 10 pounds for medium and large burners, and heated from a temperature of 60ºF (16°C) plus or minus 2°F (-17°C) to a temperature of 200°F (94°C). Standard utensil for this test shall be an 8 quart 6½ inches deep, straight sided, approximately 0.050 inch thick, aluminum cooking utensil with a flat bottom and a 1 inch radius edge and an inside diameter of 9 ½ inches.

The amount of gas consumed shall be recorded and corrected to standard barometric condition of 14.65 psig pressure at 60ºF(16°C). The heating value of the gas shall be ascertained and the thermal efficiency shall be calculated from the following formula:-

Thermal $\frac{(W + W_v) \times (\theta_2 - \theta_1)}{}$

Efficiency Btu per cu. ft.× Q×CF

Where:

W = Weight of water, pounds.
Wv = Water equivalent of utensil = weight if utensil in lbs × 0.22.
θ1 = Initial temperature of water, ºF
θ2 = Final temperature of water, ºF
Q = Gas consumption as shown by meter, cubic feet
CF = Correction factor to reduce observed gas volume to 30 inches of Mercury pressure and 60ºF(16^{o}C)

A check test shall then be conducted.

3.5 WALL AND FLOOR TEMPERATURE:

Maximum temperature on wall adjacent to the back and side of a gas range shall be not more then 120ºF (49^{o}C) in excess of a room temperature of 70ºF (21^{o}C)at the end of 60 minutes.

3.6 OVEN HEATING CAPACITY:

Oven and their controls shall be designed so that oven temperature can be increased from room temperature to 400ºF (204°C) within 10 minutes.

3.6.1 METHOD OF TEST:

Oven temperature shall be measured by an indicating or recording potentiometer and 5 parallel-connected thermo-couples, one located at the centre and the other four equally spaced between the centre and corners of the oven on the diagonals of a horizontal plan through the centre of the oven. The observed time shall not exceed 10 minutes.

3.7 OVEN HEAT DISTRIBUTION:

The heat distribution in the oven shall be uniform.

3.8 GRILL HEAT DISTRIBUTION:

The heat distribution in the grill shall be uniform. This requirement shall be deemed met when bread covering the entire grilling area will be toasted to an oven brown in not more than 10 minutes. Grilling area for this test shall be equal to 35 per cent of the horizontal across-sectional area of the grill compartment.

3.9 GRILL TEMPERATURE:

Average grill temperature shall reach 530°F (277°C) above room temperature within 12 minutes.

3.10 TEST FOR TEMPERATURE INDICATION BY OVEN THERMOSTAT:

With oven empty, the temperature indicated by the thermostat when compared with a thermometric reading shall show no greater variation than that permitted in accordance with the method of test prescribed below:

Temperature reading shall be taken with an indicating potentiometer and 5 parallel-connected thermo-couples one located at the centre of the oven and the other 4 equally spaced between the centre and the corner of the oven.

3.11 TEST FOR TEMPERATURE VARIATION OF OVEN WHEN OTHER BURNERS ARE IN OPERATION:

Changes in oven temperature shall be not more than 52°F (11°C) as the result simultaneous operation of any section of the range with the oven for 1 hour.

3.12 IGNITION:

There shall be access for lighting by a match and ignition shall be smooth whether a match or an ignition device provided on the appliance is used. Where practicable the flame should be visible either directly or by reflection when the appliance is working.

4. MARKING

Each appliance shall be indelibly marked with the following

i. Manufacturer's name or trade mark (embossed)
ii. Knob's "on" and "off" position.
iii. Country of origin.
iv. Gas input rating
v. Thermal Efficiency

Brochure with instruction for use shall be provided in national and English language.

It may also be marked with the PS Mark.

NOTE – The use of PS Mark is governed by the provision of the Pakistan Standards and Quality Control Authority Ordinance Act-VI of 1996, and the rules and regulations made under the ordinance. Products bearing PS Mark are protected with the guarantee that they have been produced to comply with requirements of the relevant standard under a well defined system of inspection, testing and quality control during production. Particular governing conditions under which a license for the use of the PS Mark may be granted to manufacturers, may be obtained from the (PSQCA) Pakistan Standards and Quality Control Authority.

5. PACKING:

It shall be packed in accordance with the best prevalent trade practice or as agreed between the manufacturer and purchaser taking care of safety requirement during handling, transit and storage.

The supplier shall also supply on instruction card giving the following information.

i) Brief instructions for installation and regulation which include piping and fitting of terminal, if any.
ii) Instruction for the correct operation of the appliance.
iii) Manufacturers name and address.
iv) Guarantee period, serviced or repair, and replacement of parts.